1. SUMMARY

Gas turbine engine simulation systems are an important element of the process that supports design, development and product support activities. This lecture will describe the development and utilization of these software systems. A wide range of program requirements will be described including user interfaces, numerical methods, software quality assurance, model and problem definition, model validation, program architecture, training, portability, reliability, error detection and documentation.

2. INTRODUCTION

There are three basic functions which can be identified in connection with the development of a simulation program. These are (1) the definition of the mathematical model, (2) the determination of the evaluation methodology to be used, and (3) the creation of the program. Six engine simulation programs with which I have been involved provide typical examples of the software design, management and development techniques that have been applied to engine simulation systems. From this experience, it is possible to formulate some basic guidelines concerning the definition of requirements for new engine simulation systems.

3. HISTORY

When simulation was first recognized as a valued engineering resource, the worker who chose the methodology was also responsible both for the definition of the model and for writing the computer program. As simulation methodology has become more sophisticated, the recognition that it represents a distinct discipline has increased. Recently, the trend has been to integrate some elements of the modeling process into a methodology group in order to concentrate the available expertise. This has had the beneficial effect of freeing the engineer from the task of defining the basic structure of the mathematical model necessary for a particular application.

The first engine simulation programs were written by their users and were intended to represent a single model of engine. With the recognition that each of these individual programs could benefit from the use of a common framework and utilities, the notion of a simulation system capable of meeting the needs of several different engines became widely accepted. The common features and contrasting architectures that have been included in the systems surveyed here will be discussed later.

4. PRACTICES

The introduction of more general modeling facilities has also served to promote a wider utilization of simulation programs by the engineer. As time goes by, these simulation tools will allow interaction on a level requiring little or no knowledge of the simulation or modeling technology employed. However, the current state-of-the-art requires that both